than twice that required to maintain it when once started. These experiments show that the behaviour of a gas with reference to the passage of an electric spark is analogous to that of a vapour condensing to a liquid, the freezing of a liquid, or the deposition of crystals from a saturated solution. For in the case of a gas which contains a foreign substance (water vapour) the potential difference which the gas can support without a spark passing is approximately steady, but when the gas is carefully dried it can support an abnormally large potential difference, though when once the discharge has started the potential difference at once falls to its normal value. The passage of the spark producing a supply of modified gas which persists for some time after the discharge has stopped.

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE.*

Oxford.—The opening of the new department of Human Anatomy was the occasion of some ceremony on Saturday afternoon. The Vice-Chancellor presided at a large gathering of scientific and medical men, including some distinguished visitors from the leading medical schools and universities. After speeches from Sir William Turner, Mr. Arthur Thomson, Sir Henry Acland, and Prof. MacAlister, the Vice-Chancellor declared the buildings open, and the proceedings closed with a vote of thanks to the Vice-Chancellor, moved by Prof. Burdon Sanderson.

The lectures and practical courses in the Natural Science Department are as follows for the current term:—In Physics, Prof. Clifton lectures on Electricity, and gives practical instruction with the assistance of Mr. J. Walker and Mr. S. A. F. White. Mr. R. E. Baynes, lectures at Christ Church on Heat and Light, and Sir John Conroy and Mr. F. J. Smith lecture at Balliol and at Trinity College, respectively, on Elementary Physics and on Mechanics and Physics.

In Chemistry, Prof. Odling lectures on Organic Chemistry, and Mr. W. W. Fisher, on Inorganic Chemistry. Other lectures and practical instruction are given by Mr. J. Watts, Mr. V. H. Veley, Mr. J. E. Marsh, and Mr. J. A. Gardner. Mr. Vernon Harcourt and Mr. P. Elford lecture at Christ Church and St. John's respectively. Prof. A. H. Green lectures on Geology in the Museum on Mondays, Wednesdays, and Fridays.

Prof. Ray Lankester lectures three days a week on the Comparative Anatomy of the Vertebrata, and Dr. W. B. Benham and Mr. G. C. Bourne give other lectures in the Linacre Professor's Department. Mr. J. Barclay Thompson lectures on the Osteology of Fish and Amphibia; and the Hope Professor of Zoology, on Means of Defence in the Struggle for Existence.

In Physiology, lectures and practical instruction in the subjects for the Final Honour Examination are given by Prof. Burdon Sanderson, Mr. J. S. Haldane, and Mr. M. S. Pembrey.

Prof. S. H. Vines gives advanced and elementary courses on Botany at the Botanical Gardens.

In Anthropology, lectures are announced by Dr. E. B. Tylor, by Mr. H. Balfour, and by Mr. Arthur Thomson.

It is announced that the examination for a Biological Fellowship at Merton College will commence on November 14.

Examinations for Natural Science Scholarships and Exhibitions at Balliol, Christ Church, and Trinity, are announced to begin on November 21.

Cambridge.—The Vice-Chancellor gives notice that Mr. H. Yule Oldham, University Lecturer in Geography, will deliver an inaugural lecture on the progress of geographical discovery, in the large lecture theatre of the chemical laboratory, on Tuesday, October 24, at noon.

During the Michaelmas and Lent terms, Mr. Oldham will give courses of lectures on the principles of physical geography, in the same theatre, on Thursdays, at noon, beginning on October 26.

The Council of the Royal Geographical Society offer to award during the present academical year an exhibition of £100 to be spent in geographical investigation (physical or historical) of some district approved by the Council, to a member of the University of not more than eight years' standing, who shall have during his residence attended the courses of the lectures in geography. Further particulars will be announced.

The office of Director of the Fitzwilliam Museum is vacant by the resignation of Dr. Middleton. A new Director will be appointed on Friday, November 17. The stipend is £300 a year. Candidates are to send their names to the Vice-Chancellor by Friday, November 10.

The Walsingham Medal, founded by the High Steward of the University, will be offered during the present academical year for the best monograph or essay giving evidence of original research in any subject connected with biology or geology. Essays are to be sent to Prof. Newton by October 1, 1894.

There are this year 132 freshmen who have indicated their intention of studying medicine in the University.

Entrance Scholarships in Natural Science have been awarded at Christ's College to A.V. Cunnington (£60), Clifton College, and J. Hart-Smith (£30), Berkhampstead School; and at Emmanuel College to W. F. A. Ermen (£50), Clifton College, and R. G. K. Lempfert (£50), Manchester Grammar School. At Downing College an Examination for Minor Scholarships (£50) in Natural Science will be held on April 17, 1894. At St. John's the Examination for Natural Science Scholarships (£80 and under) and Exhibitions (£50 and under) will begin on December 5, 1893.

The United States Bureau of Education has published a remarkable "Circular of Information," by Dr. Arthur Macdonald, entitled "Abnormal Man." The volume includes essays on education and crime and related subjects, with digests of literature and an extensive bibliography. With regard to the effect of education on crime a statistical investigation shows that in France and Italy there has been an increase of both education and crime. Germany shows an increase of habitual criminality and a general increase of both university education and crime. As far as statistics are accessible, Austria shows an increase in education and a decrease in crime. Also, while there has been a decrease in the number of convictions for crime from 1881 to 1887 in Norway and Sweden, there has been an increase in education. But in Norway alone for the year 1888-89 there was an increase in the number of crimes. In England, Scotland, and Ireland all statistics are in accord in showing an increase in education and a decrease in crime from 1885-1890. Japan and Saxony also exhibit an increase in education and a decrease in the number of convictions. It thus appears that while some countries show an increase in both education and crime, yet not a few, and some of the most developed nations, show an increase of education and a decrease of crime. The statistics, therefore, fail to show the exact relation between education and crime.

## *SCIENTIFIC SERIALS.*

*American Journal of Mathematics*, vol. xv. No. 3. (Baltimore, 1893).—On groups whose orders are products of three prime factors, by F. N. Cole and J. W. Glover (pp. 191-220). In this paper the authors fully determine] the groups for three prime factors, equal or unequal. Those of order $pq$ and $p^2$ are known from Netto.—The nature and effect of singularities of plane algebraic curves, by Miss Scott (pp. 221-243) is a continuation of the paper in vol. xiv. In the earlier memoir the method employed was stated to be directly applicable, in general, to the determination only of the joint components of the singularity; in this the restriction is removed, and it is shown that the process enables one, in every case, to enumerate the double lines (double tangents and inflexional tangents) involved in the singularity.—The elliptic irregularities in the lunar theory, by E. W. Brown (pp. 244-263), gives a general solution in series of the problem: a system of three bodies is in motion in one plane, the first is revolving about the second, and is disturbed from its elliptic orbit by the third. The third body is supposed to be of infinite mass, and to be moving in a circle of infinite radius with a finite angular velocity. Given the relative positions of the three bodies at any one time, to find their relative positions at any other time. The differential equations used at the outset are given in Dr. Hill's paper (vol. i.) and M. Poincaré's researches (*Acta Math.* vol. xiii.) afford considerable help in the work.—On the transformation of linear differential equations of the second order with linear coefficients, by Oskar Bolza (pp.

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264–273), is a fresh treatment of the problem by methods of the theory of invariants.—On certain properties of symmetric, skew-symmetric, and orthogonal matrices, by W. H. Metzler (pp. 274–282) proves in another way properties of these matrices which have been obtained by Dr. Taber (*L. Math. S. Proc.* vol. xxii.), and Mr. Buchheim (*Messr. of Math.* vol. xiv.). The number closes with a deduction and demonstration of Taylor's formula, by W. H. Echols (pp. 283–4).

*Symons's Monthly Meteorological Magazine* for September contains an interesting climatological table for seventeen selected stations in the British Empire, for the year 1892. This valuable summary has now been published for several years, and corresponding monthly tables with remarks have been also regularly printed since July, 1881. The highest temperature in the shade was 110°·8 at Adelaide on January 20. This station also recorded the highest temperature in the sun, and had the lowest mean humidity. The lowest shade temperature was 44°·4 at Winnipeg, on January 18; this station had also the greatest yearly and daily range, and the lowest mean temperature. The dampest and most cloudy station was Esquimalt. The greatest rainfall was 95·1 inches at Bombay, and the least, 21·3 inches at Jamaica. Attention is again drawn to the fact that the Australian stations record higher temperatures both in shade and in sun than occur at the East Indian stations. A table is given of the absolute maximum temperature in shade and sun for each of the ten years 1883–92, at Adelaide and Calcutta, and shows an average excess at Adelaide of 5°·2 in shade, and 6°·4 in sun; but the heat is more prolonged in India, and in the hottest months the average maxima in the shade are always higher at Calcutta.

*Wiedemann's Annalen der Physik und Chemie*, No. 9.—Luminous phenomena in vessels filled with rarefied gas under the influence of rapidly alternating electric fields, by H. Ebert and E. Wiedemann. Gas vessels without electrodes were placed between the condenser plates of a Lecher wire combination. The luminous phenomena were investigated and discussed from the point of view of tubes of electric force undergoing displacement. It was shown that the portion of energy dissipated by radiation is perfectly commensurable with that occurring in the field generally. The glowing of a gas is therefore a sufficient cause for diminution of pressure in tubes of force, and hence for the displacement of tubes in the field, leading to a dissipation of the energy contained in them. Experiments were also made with tubes fitted with electrodes, one or both of which were attached to an end of the Lecher system. It was shown that any metal plate in contact with a rarefied gas and exposed to slightly damped electric oscillations, shows all the phenomena of a kathode. Also, that at every wall suitably crossing a gaseous space filled with electric oscillations a kathode is produced.—Vapour pressures of aqueous solutions at 0° C. by C. Dieterici.—Thermo-electric studies, by E. Englisch.—Concerning the physical interpretation of thermo-electricity, by F. Braun.—Density of dilute aqueous solutions, by F. Kohlrausch and W. Hallwachs.—Solubility of some "insoluble" bodies in water, determined by the electric conductivity of the solutions, by F. Kohlrausch and F. Rose. The determination of small quantities of "insoluble" substances in a large amount of water is subject to many experimental errors due to the necessity of evaporating large quantities of water at the boiling point, whereby the solubility of the material of the dish becomes a disturbing factor. As the laws governing the relation between concentration and electric conductivity are fairly well known, it is possible to arrive at an estimate of minute quantities of dissolved matter by a determination of the electric conductivity of the solution. This method has proved to be very simple, expeditious, and accurate.—On heat generated by dielectric polarisation, by A. Kleiner.—Experiments on the generation of electricity by small drops, by A. L. Holz. A jet of mercury was projected upon an amalgamated copper plate, whence it rebounded in small globules on to a glass plate, and thence to the electrometer. The increase of potential was found to be proportional to the sectional area of the jet, the pressure and height of fall of the mercury, and the size of the saturated glass plate.—Dielectric constants of liquid bodies as dependent upon temperature and the Mossotti-Clausius formula, by A. Franke.—Experiments on the interference of electric waves in air, by I. Klemencic and P. Czermak.—Notice on secondary heatings of galvanic cells, by H. Jahn.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Entomological Society**, October 4.—Henry John Elwes, President, in the chair.—Mr. F. Merrifield exhibited specimens showing the effects of temperature in the pupal stage on several species of Lepidoptera. *Vanessa polychloros* was much darkened, especially towards the hinder margin, by a low temperature. *Vanessa c-album* showed effects on both sides, especially in the female; they were striking on the under side. Some *Vanessa io* showed the gradual disintegration, by exposure to a low temperature, of the ocellus on the fore wing, which in the extreme specimens ceased to be an ocellus, and was a remarkable confirmation of Dr. Dixey's views of the origin of that ocellus, as exemplified in the plate attached to his paper in the Entomological Society's Transactions for 1890. Mr. Goss stated that in his experience of *V. c-album* in Northamptonshire, Gloucestershire, Herefordshire, and Monmouthshire, the form with the pale under side was the first brood, occurring in June and July; and that the specimens of the second brood, occurring from the end of July to October, were invariably dark on the under side.—Mr. A. H. Jones exhibited Lepidoptera collected in Corsica in June last, including dark forms of *Polyommatus phlæas*, *Lycæna astrarche*, in which the orange marginal band is very brilliant on upper and under sides of both wings, *Lycæna argus*, the females of which are much suffused with blue, probably var. *calliopis*: a series of *Vanessa urticæ* var. *ichnusa*, bred from larvæ, *Argynnis elisa*, *Satyrus semele* var. *aristæus*, *Satyrus neomiris*, *Cœnonympha corrina*, both spring and summer brood, and many others.—Mr. G. C. Champion exhibited for Mr. G. A. J. Rothney, a number of *Methoca ichneumonoides*, Latr. (female), taken at Bexhill, Sussex, showing great variation from the usual large black and red form.—Dr. D. Sharp, F.R.S., exhibited a pupa of *Galleria melonella*, on which the eggs of a parasitic Hymenopteron had been deposited while the insect was in the cocoon. He also exhibited the hitherto unique *Asprostoma planifrons*, Westw.—Mr. J. J. Walker exhibited specimens of the following species, viz. *Halobates sericeus*, from the Pacific; *H. sobrinus*, and *H. wüllerstorffi*, from Marquesas Islands; *H. princeps*, from the China Sea; and a female of *H. wüllerstorffi*, with ova attached.—Mr. W. H. B. Fletcher showed a variable series of 75 specimens of *Cymatophora or*, bred in 1893 from larvæ from Sutherland, a series of about 40 *C. ocularis* bred-in from stock from Oundle; also a series of 33 moths, all females, supposed to be hybrids between *C. ocularis* male and *C. or* female, from the above stock in each case, bred as a second brood in August and September, 1893. He stated that he placed the reputed parents in a muslin sleeve on a branch of *Populus nigra*, and did not open the sleeve until the resulting larvæ required fresh food. The supposed hybrids resembled the female parent, except that both orbicular and reniform stigmata were very conspicuous, being pure white filled up slightly with black.—Mr. F. J. Hanbury exhibited a specimen of *Leucania vitellina*, taken at Brockenhurst on August 24, 1893, and another taken at Freshwater, Isle of Wight, on September 7; also an extraordinary *Gonepteryx rhamni*, showing red blotches at the tips of the fore wings, taken at Walthamstow, Essex.—Mr. C. G. Barrett exhibited a gynandrous *Argynnis paphia* recently taken in the New Forest by Mr. Cardew.—Mr. J. M. Adye exhibited a specimen of *Deilephila livornica* recently caught at Christchurch, Hants.—Mr. Elwes exhibited and described two species of the genus *Œneis* (*Chionobas*, Bdv.) *Œ. leani* and *Œ. alberta*, from North America, which had not been previously described, and stated that he had prepared a revision of this very difficult genus, which would be read at the November meeting.—Mr. Osbert Salvin, F.R.S., exhibited a new genus and species of Papilionidæ (*Baronia brevicornis*). He also communicated a paper entitled "Description of a new genus and species of Papilionidæ from Mexico."—Dr. Sharp read a paper entitled "On the Cost and Value of Insect Collections." Mr. W. F. H. Blandford, Mr. McLachlan, F.R.S., Mr. Jacoby, Mr. Waterhouse, and the President took part in the discussion which ensued.—Prof. Auguste Forel communicated a paper entitled "Formicides de St. Vincent, récoltées par Mons. H. H. Smith."—Mr. Blandford read a paper entitled "Description of a New Subfamily of the Scolytidæ." The President, Mr. Jacoby, and Mr. Waterhouse took part in the discussion which ensued.

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